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Invasive Carcinoid Tumor of the Heart

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Carcinoid tumors have been described in almost every organ and may affect virtually every body system. Cardiac involvement manifesting as right-sided valvular disease is characteristic of the carcinoid syndrome; however, direct myocardial involvement is unusual. We present a case of an invasive carcinoid tumor whose primary manifestation was myocardial invasion. *J. Surg. Oncol. 1997;66:264–266.* © 1997 Wiley-Liss, Inc.

KEY WORDS: carcinoid syndrome; enterochromaffin cells; myocardial invasion; occult pancreatic primary tumor; valvular disease

INTRODUCTION

Fibrosis of right-sided heart valves in patients with carcinoid tumors is well known. Direct invasion of the heart by malignant carcinoid tumors, on the other hand, is quite rare. We have encountered a patient who had an invasive malignant carcinoid of the left ventricle, but no evidence of the presence of a carcinoid tumor at any other location.

CASE REPORT

A 33-year-old Caucasian male had been followed in the Gastroenterology Clinic for one year for treatment of persistent epigastric pain, believed to be secondary to chronic pancreatitis. Following an exacerbation of the pain, a CT scan of the abdomen was performed, which showed a normal pancreas. Serum amylase was not elevated. However, on the most cephalad image the CT scan revealed a soft tissue mass just above the diaphragm. Additional images were then obtained, confirming a mass lesion involving the left ventricle (Fig. 1). The lesion could also be seen on closer inspection of the chest radiograph (Fig. 2). The patient was referred to the Thoracic Surgery Service for further evaluation and treatment.

Examination revealed a healthy man whose only complaint was persistent midepigastric pain. Cardiopulmonary examination was normal. All laboratory values were within normal limits, and an electrocardiogram revealed no abnormality. The differential diagnosis included myocardial rhabdomyosarcoma, lymphoma or a metastatic deposit from an occult primary lesion. The patient was taken to the operating room for definitive diagnosis. A left anterior mediastinotomy was performed, and the fifth intercostal space was opened. On examination, a mass contiguous with the heart was palpable. The pericardium was opened and the mass was found to have invaded a large part of the left ventricle (Fig. 3). An incisional biopsy of the lesion was obtained. Histologic examination of the tumor revealed a relatively monomorphic tumor cell population with a prominent nesting or organoid pattern (Fig. 4). No necrosis was seen, and the mitotic rate was 3 per 10 high power fields (3/10 HPF). Immunoperoxidase staining for chromogranin was positive. The argentaffin reaction (Fontana-Masson) was negative, but the argyrophil reaction (both Grimelius and Churukian-Schenk) was positive. Electron microscopy confirmed the presence of dense core granules which were fewer in number and more evenly distributed throughout the cytoplasm than in typical carcinoids. Thus, the features were most consistent with an atypical carcinoid tumor. Recovery from the biopsy was uneventful.

Further workup revealed that serum serotonin (5-HT) and urinary 5-hydroxy-indoleacetic (5-HIAA) levels were not elevated. Cardiac function was evaluated by echocardiography and MUGA scans and was found to be unimpaired. Close scrutiny of the abdominal CT scan revealed no evidence of an intraabdominal primary lesion. The scanning agent 131 I-metaiodobenzylguanidine (131 I-MIBG) was utilized for further delin-

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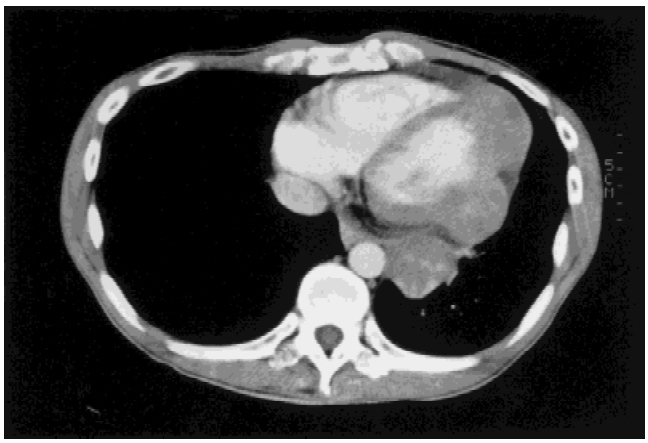

Fig. 1. CT scan of the chest revealing soft tissue mass involving the left ventricle.

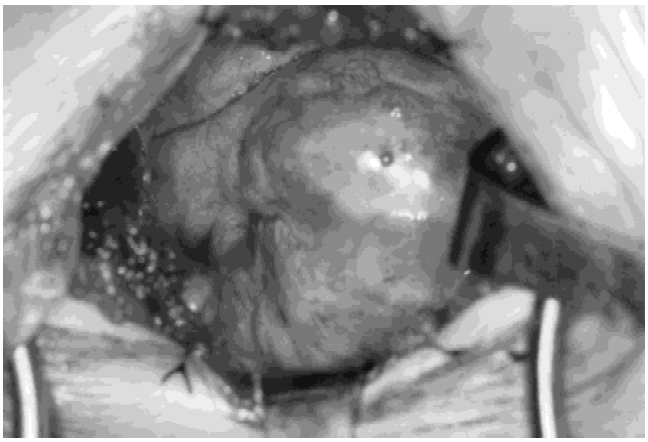

Fig. 3. Operative photograph of the mass invading the left ventricle.

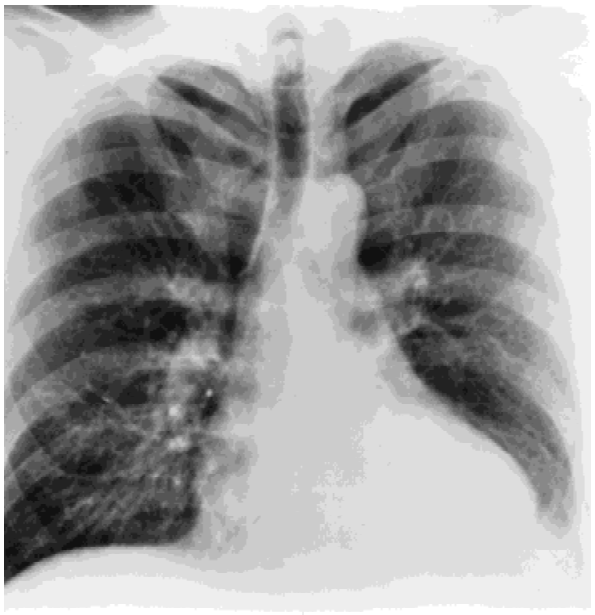

Fig. 2. Chest radiograph indicating the ill-defined left ventricular border.

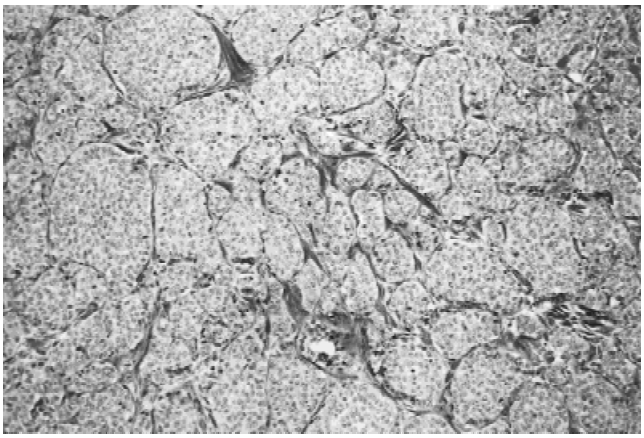

Fig. 4. Low power photomicrograph of the tumor showing prominent nesting pattern.

eation of a possible occult mid-gut primary tumor; however, uptake occurred only in the cardiac lesion.

Consideration was given to resection of the tumor and orthotopic heart transplantation. A MRI scan documented extensive myocardial involvement. To further delineate the lesion, a controlled pneumothorax was induced, and CT scan confirmed the lesion to be adherent to the descending aorta. Although the tumor displaced the left lung slightly, it appeared to arise within the left ventricle of the heart and not within the lung. The bronchial tree was not involved on CT examination or bronchoscopy. Because of the extensive nature of the carcinoid tumor, surgical intervention was not an option. The patient was treated with palliative external beam irradiation. The epigastric symptoms resolved shortly after initiation of the radiation.

Six months later the patient complained of progressive anorexia and weight loss and was jaundiced on physical examination. CT scan of the abdomen revealed a new mass at the head of the pancreas and enlarged lymph nodes in the porta hepatis. The patient underwent CT-guided fine needle aspiration of the pancreatic mass, which demonstrated a neoplasm with neuroendocrine features morphologically similar to the primary cardiac lesion (Fig. 5). Endoscopic retrograde cholangiopancreatography and placement of a biliary stent were performed in combination with palliative external beam irradiation to the pancreas, with some relief of symptoms. It was postulated that the lesion in the pancreas was the occult primary that initially manifested as the invasive cardiac lesion.

The patient was subsequently treated with 5FU and radiation to the head of the pancreas. He developed liver metastases, which were treated with chemoembolization.

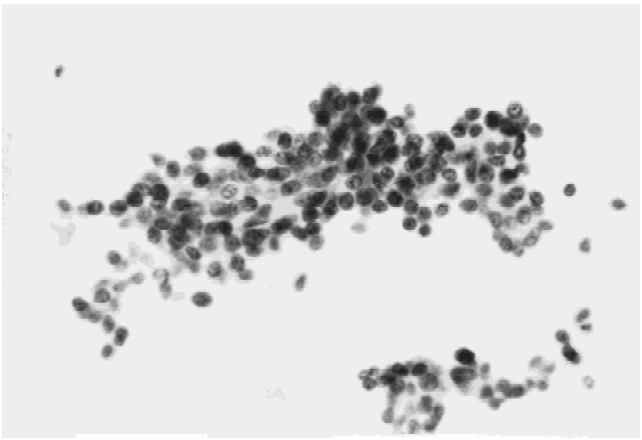

Fig. 5. Fine needle aspirate of the pancreatic mass demonstrating monomorphic neuroendocrine features similar to those seen in the previous biopsy.

He did fairly well until the development of brain metastasis in August 1995. Although he underwent cranial irradiation, he died in December 1995.

DISCUSSION

Carcinoid tumors, which arise from enterochromaffin cells, can originate from almost any organ in the body [1]. In most large series the most frequent sites of origin are appendiceal, ileal and bronchial. In a fair percentage of cases (20%) there is such extensive abdominal and hepatic involvement that the primary site of origin cannot be identified [2].

Carcinoids have variable malignant potential and are composed of multipotential cells with the ability to secrete humoral substances, the most important of which are serotonin and substance P. The ''carcinoid syndrome,'' which has been described extensively, occurs in less than 5% of patients with malignant carcinoid syndrome [3]. The primary importance of carcinoid tumors is not the carcinoid syndrome but the malignant potential of the tumors themselves.

Cardiac manifestations of the carcinoid syndrome were first recognized in 1952 when a patient with metastatic carcinoid was found to have severe pulmonic valvular stenosis and tricuspid insufficiency [4]. The valvular heart disease is due to irreversible endocardial fibrosis, similar to the fibrosis noted in the gut wall, in the retroperitoneum, and around the mesenteric blood vessels in patients with the malignant syndrome. The right-sided valves are exposed to high serum levels of serotonin, and this is believed to be the initiating factor for the endocardial fibrosis [2]. The valvular disease is limited to the tricuspid and pulmonic valves and occurs most commonly in patients with hepatic metastasis. The pulmonary vascular bed acts as a filter to deactivate the serotonin, thereby preventing the mitral or aortic valves from becoming involved [2].

The tumor in the present case may have arisen in the heart itself, or it may have arisen from an occult pancreatic primary and metastasized to the heart. In either event, this represents a highly unusual case. A primary carcinoid of the heart has not been reported, and metastasis to the heart is quite uncommon. Furthermore, although the primary site of origin of a carcinoid may often be difficult to discern because of bulky intraabdominal disease, it is distinctly unusual for the primary site to be completely occult in the face of a large solitary metastatic deposit.

Only four cases of gastrointestinal carcinoid metastatic to the heart have been reported [5–8]. One of these cases [6] is similar to this case in that the initial manifestation was that of an invasive myocardial carcinoid, with the primary carcinoid originating in the ileum. The ileal primary was occult and was identified only at autopsy. In the other three cases, extensive abdominal involvement was present at the time a small metastatic deposit was identified in the heart. In addition, a bronchial carcinoid invading the left atrium has been described [9]. In this case, the tumor clearly originated in the right lung; and although extension to the left atrium occurred, it was limited, making surgical resection via right pneumonectomy possible.

Carcinoid tumors are unusual and can present with involvement of almost any organ system. This case may represent the first reported case of primary myocardial carcinoid; however, it is more likely that the tumor was a metastatic deposit from an occult pancreatic primary. An awareness of the broad spectrum of manifestations of carcinoid tumors may aid in their early diagnosis and treatment.

REFERENCES

1. Grahame-Smith DG: ''The Carcinoid Syndrome.'' London: William Heineman Medical Books, 1972.
2. Feldman JM: Carcinoid tumors and the carcinoid syndrome. Curr Prob Surg 1989;26:835–885.
3. Oates JA: The carcinoid syndrome. N Engl J Med 1986;315:702.
4. Biorck G, Axen O, Thorson A: Unusual cyanosis in a boy with congenital pulmonary stenosis and tricuspid insufficiency: Fatal outcome after angiography. Am Heart J 1952;44:143–148.
5. Schiller VL, Fishbein MC, Siegel RJ: Unusual cardiac involvement in carcinoid syndrome. Am Heart J 1986;112:1322–1323.
6. Fine SN, Gaynor ML, Isom OW, Dannenburg AJ: Carcinoid tumor metastatic to the heart. Am J Med 1990;89:690–692.
7. Lund JT, Ehman RL, Julsrud PR, et al.: Cardiac masses: Assessment by MRI. Am J Radiol 1989;152:469–473.
8. Funari M, Fujita N, Pech WW, Higgins CB: Cardiac tumors: Assessment with Gd-DTPA enhanced MR imaging. J Computer Assisted Tomogr 1991;15:953–958.
9. Darby C, Sinclair M, Westaby S: Treatment of a malignant bronchial carcinoid affecting the mediastinum and left atrium by radical two stage resection with cardiopulmonary bypass and somatostatin infusion. Br Heart J 1990;63:55–57.